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DEPT. OF TRANSPORTATION
DOCKETS

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February 28, 2008

The Honorable Nicole Nason,
Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE
West Building
Ground Floor Docket Room W12-140
Washington, D.C. 20590

Subject: Petition for Reconsideration – Event Data Recorders

Reference: 49 CFR Part 563 Docket No. NHTSA–2008–0004; 73 Fed. Reg. 2168

Dear Administrator Nason:

The Alliance of Automobile Manufacturers (Alliance), whose members include BMW Group, Chrysler LLC, Ford Motor Company, General Motors, Mazda, Mercedes-Benz, USA, Mitsubishi Motors, Porsche, Toyota and Volkswagen hereby petitions for reconsideration and requests clarification of certain technical aspects of the final rule; response to petitions for reconsideration regarding Event Data Recorders, published in the January 14, 2008 Federal Register.

The Alliance appreciates the time and effort that the agency has devoted to understanding the issues raised by Alliance and its members and, in general, granting the majority of the recommendations in our August 2006 petition.

The following sections of this petition present the specific items for which the Alliance seeks revision or clarification:

**Delete Acceleration Data from Part 563**

The Alliance again petitions NHTSA to remove lateral, longitudinal, and normal acceleration data from Part 563. Acceleration data elements should be removed from Tables II and III of the regulation, which will allow the definitional and other references to acceleration data to be removed from the regulation as well.

The Alliance petition for reconsideration of the original (August 2006) Part 563 rule requested that acceleration data be removed from the regulation. That Alliance petition also

identified several needed revisions to acceleration requirements if the agency chose to retain acceleration data. In the amended EDR rule published on January 14, 2008, the agency retained acceleration data and adopted many of the technical amendments identified in the original Alliance petition for reconsideration.

However, there are now new reasons for the agency to reconsider its decision to retain acceleration data in Part 563. The Alliance offers the following additional information as justification for the agency to remove acceleration data from the regulation:

**No Incremental Information:**

Given the revisions that have been adopted in the January 14, 2008 EDR rule, retaining acceleration data in the regulation provides no incremental crash assessment information. In the August 2006 final rule, a sampling rate of 500 samples per second (i.e., 2-millisecond data) was specified for acceleration data, while a sampling rate of 100 samples per second (10-millisecond data) was specified for delta-V data. Both acceleration and delta-V data were and continue to be required to be recorded from time zero to 250 milliseconds. However, the amended rule published in January of 2008 specifies a sampling rate of 100 samples per second (10-millisecond data) for both acceleration and delta-V. Because the sampling rate and measurement interval are now the same for acceleration and delta-V, the inclusion of acceleration data in the regulation provides no incremental information. The specified acceleration data is obtainable by simply dividing the difference between two adjacent delta-V values by the 10-millisecond interval in order to separate those two values. In summary, it is pointless to separately record acceleration data at a rate and interval that matches the rate and interval of delta-V data, given that these acceleration data can be derived by simple arithmetic manipulation of the delta-V data.

**Unintended Safety Consequence**:

Retaining acceleration data in Part 563 could have unintended safety consequences. As previously explained to the agency, a number of vehicle manufacturers record acceleration data in the EDR. For example, at least one OEM records 2-millisecond data from time zero to 70 milliseconds. As discussed in the Alliance petition for reconsideration of the August 2006 rule, this higher-resolution acceleration data is useful for manufacturers to evaluate airbag performance and refine airbag deployment algorithms. However, NHTSA's acceleration data provide no incremental value over delta-V data for crash investigation and reconstruction studies. Further, while the 250-millisecond recording interval can be important for crash investigation, the 70-millisecond interval is appropriate for evaluating airbag performance.

As explained in the previous paragraph, the requirement to record acceleration data provides no useful additional information because the acceleration data can be readily derived from delta-V data. The manufacturer's other option would be to exceed the specified 10-millisecond sampling rate, for example by recording 2-millisecond data from time zero to 250 milliseconds. But this recording of 125 data points (or 250 data points for 2 events) would involve a significant cost penalty, due to increased memory

requirements, compared with today's practice of recording 35 acceleration data points (2-millisecond data from time zero to 70 milliseconds). This significant cost penalty is contrary to the agency's stated objective of standardizing EDR data without appreciably increasing the cost of today's EDRs. This cost increase combined with several other issues involving Part 563 acceleration data (discussed in this and the previous Alliance petition for reconsideration) provide strong incentive for manufacturer's to not record acceleration data at all, thereby precluding further opportunities to refine airbag deployment algorithms.

**Acceleration Data Accuracy:**

The Alliance is not aware of any practical way to assess or comply with the ± 10% accuracy requirement specified for acceleration data. We appreciate that the amended rule has revised the acceleration data accuracy requirement from ± 5% to ± 10%, consistent with our recommendation in the original Alliance petition. The 10% tolerance is needed to account for various sources of error including sensor accuracy, cross-axes error sensitivities, analog-to-digital signal conversion, etc.
On further consideration, however, there is a more fundamental issue with the acceleration data accuracy requirement. Alliance members know of no practical way to assess the accuracy of EDR acceleration data relative to the acceleration data recorded by crash-lab instrumentation. Part 563 specifies recording of 25 acceleration data points for a given event (10-millisecond data from time zero to 250 milliseconds). Presumably the 10% accuracy requirement of Part 563 means that each of the 25 acceleration data points recorded by the EDR must be within 10% of the acceleration data recorded by the crash-lab instrumentation at the corresponding points in time. There are alternative interpretations of what the 10% accuracy requirement means, but the possibilities that we have considered do not address the core problem, namely, that EDR acceleration data at any moment in time will not necessarily coincide with the crash-lab measured acceleration data at the same moment in time, even if the EDR and crash-lab acceleration data are both perfectly accurate. Investigation of actual data shows that the EDR data at a particular moment in time might be + 25 g's, for example, while the crash-lab data indicates -25 g's. This large disparity is an artifact of the inherently different ways that acceleration data is collected and processed in an EDR versus how it is collected and processed in crash-lab instrumentation. EDR acceleration data is typically filtered at 400 Hz (a value that is design dependent) and results in recorded acceleration data that is phase shifted from the original acceleration signal. In contrast, crash-lab, whole body acceleration data is typically processed with a Class 60 filter and results in no phase shift. The different filter cutoff frequencies and phase-shifting means that EDR and crash-lab acceleration data are not comparable at equivalent moments in time. There are multiple compelling reasons to remove acceleration data from Part 563, and we trust the agency will be persuaded to do so. If the agency nevertheless decides to retain acceleration data, vehicle manufacturers need a specific explanation of what the ± 10% accuracy requirement applies to, under which test conditions it will be assessed (explicitly FMVSS 208 and FMVSS 214 conditions) how to assess it, and how to achieve it considering that EDR acceleration data is not comparable to crash-lab acceleration data.

**Clipping Effects:**

Revision of the acceleration accuracy requirement to ± 10% does not address "clipping" effects. The preamble to the amended final rule includes the following:

> *We are denying the petitions to modify the final rule to allow additional EDR inaccuracy due to sensor saturation or data clipping. NHTSA recognizes that in certain rare extreme crash scenarios, the crash pulse may exceed the sensor detection capacity and result in data saturation, even in sensors that have been optimized for their given purpose. In these situations, the crash pulse may cause additional reported data inaccuracy or clipping; however, by doubling the tolerance on the accelerometer data, we believe this has been sufficiently addressed."*

We agree with the agency that data clipping is an infrequent real-world occurrence. However, it is not uncommon for data clipping to occur in the crash tests that are specified for Part 563 compliance. Brief periods of deceleration exceeding 50 g's; as well as, brief-duration decelerations exceeding 100 g's do occur in the frontal and side crash tests specified in Part 563. Attachment 1 is an example of test data from a FMVSS 208 crash test, which shows a deceleration greater than 115 g's. Fifty-g accelerometers are commonly used in today's vehicles to provide appropriate resolution to support occupant restraint deployment decisions. For these reasons, the ± 10% acceleration accuracy requirement does not "sufficiently address" clipping effects as the agency contends.

For the reasons presented above and in the Alliance petition for reconsideration of the original final rule, the Alliance again petitions that acceleration data be removed from Part 563.

**Effect of Clipping on Delta-V Accuracy**

The Alliance again petitions NHTSA that the delta-V accuracy requirements should not be applicable to cases in which acceleration becomes saturated or the data is clipped. As discussed above, brief periods of deceleration exceeding 100 g's can and do occur in crash tests specified in Part 563. This clipping beyond the range of the accelerometers causes the delta-V calculation to be in error and may make it impractical to meet the ±10% delta-V accuracy requirement. An example is shown in the Delta-V plot in Attachment 1. The only countermeasure for solving this problem is to expand the measurement range of the sensor. However, expanding the sensor range may cause the detection accuracy necessary for air bag deployment to be negatively affected. This in turn could negatively affect the deployment control function of the airbag. The sensitivity of 50-g accelerometers, commonly used for airbag deployment decisions, is 0.04V/g. If the measurement range is changed from 50-g to 100-g, the sensitivity is only 0.02V/g. Noise is generated regardless of the measurement range but the influence of noise will be greater for the 100-g sensor, which will negatively affect the occupant protection performance of the airbag. Therefore, it is better for the accelerometer to have a narrow measurement range to minimize the influence of noise. We recommend that NHTSA change the Delta-V requirement to "+/-10% for events in which no acceleration saturation/ clipping occurs".

The installation of EDR is not mandatory. Requiring that the delta-V accuracy be met when clipping occurs has the possibility of negatively affecting the occupant protection performance. Therefore if no relief is given for cases when clipping occurs, this may result in Alliance members choosing not to install EDR on its vehicles if its EDR cannot meet this *requirement.*

For the reasons presented above, the Alliance petitions that the delta-V accuracy requirement be changed to"±10% for events in which no acceleration saturation/ clipping occurs".

**Incorporate Preamble Explanations into Regulatory Text**

The Alliance has identified two items that were clarified in the preamble to the amended final rule, but that were not reflected in the regulatory text of Part 563. The Alliance petitions for simple revisions to the regulatory language to convey the agency's intent. It is good practice for regulatory language to "stand alone" such that it does not need to be cross-referenced to preamble explanations of regulatory intent. This is particularly important with regard to this regulation, because other countries are using Part563 as the basis for their EDR requirements.

The two items that the Alliance requests be incorporated into Part 563, along with specific suggestions for how to reflect the agency's intent in the regulatory language, are as follows:

**Exclusion of peripheral sensors**

The preamble to the amended final rule clarified that it is not the agency's intent to include peripheral sensors within the scope of the regulation:

> *We are granting the petitions with regard to satellite or peripheral sensors, although we believe it is unnecessary to change the regulatory text to make this clarification. In the final rule, the agency expressed its intent for the EDR to capture the rigid body motion of vehicles in crashes. As the petitioners noted, the rigid body motion is best captured by collecting data centrally located in the occupant compartment of the vehicle. Data from satellite or peripheral sensors are not used for these purposes, but rather help the air bag control module and other occupant protection systems to perform optimally. We recognize that sensors located in vehicles' crushable zones may not meet the survivability standards set forth in the final rule, and therefore exclude them from those standards.*

In order to capture the agency's intent that peripheral sensors are excluded from the scope of Part 563, the Alliance recommends adding the following sentence to the end of §563.6

> Peripheral sensors that do not produce "rigid body" centroid acceleration signals are excluded from the requirements of this Part.

**External Power Source Damage**

The preamble to the amended rule clarifies that subsequent-event data need not be recorded if the external power source or sensors are damaged in the first event:

> *"We agree with AIAM that subsequent events need not be recorded if the external power source and sensors are damaged in the first event, but we do not believe that a change to the regulatory text is necessary. The regulation does not contain test requirements to determine if an EDR could survive two consecutive severe crashes. For the test requirements which are included, if an event is severe enough to interrupt the power source to the EDR, the EDR must be able to finish capturing that event, but is not required to be in a condition such that it could capture subsequent events."*

NHTSA's test procedures have historically stated that the absence of a test provision from the agency's procedure does not exempt manufacturers from the obligation to meet all requirements specified in the standard (or regulation). Accordingly, the absence of a test provision does not obviate the need for the regulatory requirements to be clear.

In order to capture the agency's intent, we recommend that a subparagraph (c) be added to the end of §563.9 that read as follows:

> (c) If power source(s) or sensor(s) are damaged during an initial event, it is not necessary to record data associated with subsequent event(s).

**Table II Clarification of Frontal Airbag Suppression Switch Status**

Upon review of the preamble explanation of NHTSA's denial of petitioners' request to drop "auto" from the options for the Table II data element entitled 'Frontal air bag suppression switch status, right front passenger', there remains some ambiguity with regard to the intended meaning of this data element. After considerable discussion, the Alliance concludes that this data element is intended to apply only to vehicles that are equipped with a manual airbag suppression switch, and that the data element is intended to indicate the position of the switch at the time of the event.

We request that NHTSA confirm this interpretation.

**Compliance Test Procedure**

The Alliance requests that the compliance test procedure for Part 563 be developed and published as soon as possible. That test procedure has the potential to elaborate and clarify the regulatory requirements. Further, a detailed test procedure will provide both the agency and vehicle manufacturers with a common understanding of compliance assessment procedures.

A specific example of how the test procedure could be helpful would be to clarify how the agency will determine delta-V accuracy. Part 563 requires $\pm$ 10% accuracy for delta-V, but it

is not clear if this requirement applies to point-by-point delta-V data, the average of delta-V over 250 ms, or the cumulative delta-V at the end point of 250 ms.

We recommend that the accuracy requirement be a root mean square average of the recorded delta-V values. The issuance of the test procedure could clarify this and other issues.

The Alliance would welcome the opportunity to participate in development of the compliance test procedure.

**Editorial Corrections**

The Alliance notes the following typographical and organizational errors that the agency could address by technical correction:

**Definitions**

*Occupant size classification* means, for the right front passenger, the classification of the occupant as an adult and not as a child, as defined in 49 CFR Part 572, subpart N, and for the driver, the classification of the driver as ~~not~~ being ~~of small stature~~ larger than a 5th percentile female (as defined in 49 CFR Part 572, subpart O.

**Table II**

The word "status" should be inserted after "foremost" in first column item "Seat track position switch, foremost right front passenger"

**Table III**

Second column requirement for "Service Brake (on, off)" and "ABS activity" should be revised to read: "On or Off"

Second Column requirement for "Stability control (on, off, engaged)" should be revised to read: "On, Off, or Engaged"

NHTSA also defines *Occupant position classification* and *Occupant size classification* in §563.5. The latter is defined *as an adult and not as a child* for the right front passenger and *not being of small stature* for the driver.

In Table II:
Occupant size classification, driver
Occupant size classification, right front passenger
Occupant position classification, driver
Occupant position classification, right front passenger

In Table III:

Occupant size *driver occupant 5th female size (y/n)*
Occupant *position size right front passenger child (y/n)*
Occupant position classification, *driver oop (y/n)*
Occupant position classification, *right front passenger oop (y/n)*

Apparently *not being of small stature* means you are larger than a 5th percentile female. The definition should clarify this (i.e. 5th percentile female size = the 49 CFR Part 572 subpart O 5th percentile adult female test dummy from the FMVSS 208 automatic suppression requiements). Because there is no clear definition of child size either, the logical step would be to incorporate the 49 CFR Part 572 subpart N 6-year-old child dummy from the FMVSS 208 automatic suppression requirements in the definition as well.

**Recommendation**

The Alliance requests that NHTSA clarify the reporting format with the following text:

| | | |
|---|---|---|
| Occupant size classification, driver | 5th percentile female or larger | Yes/No |
| Occupant size classification, right front passenger | Child | Yes/No |
| Occupant position classification, driver | Out of position | Yes/No |
| Occupant position classification, right front passenger | Out of position | Yes/No |

The definitions should also be revised to align with the above; e.g., **as a child and not as an adult** for the right front passenger and larger than a 5th percentile female for the driver.

These recommendations would make Part 563 more objective and make the test used to verify the standard more accurate and repeatable. We urge the Agency to adopt these recommendations.

If you have any questions about these recommendations or if further discussion of this petition will assist the agency in its decision please contact:

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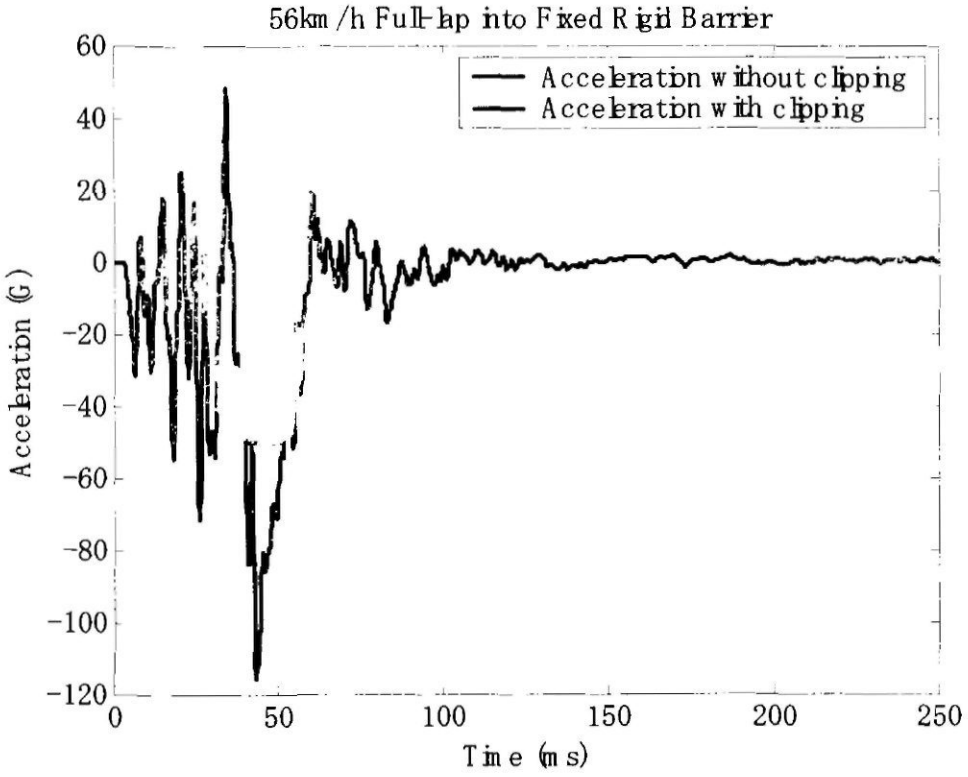
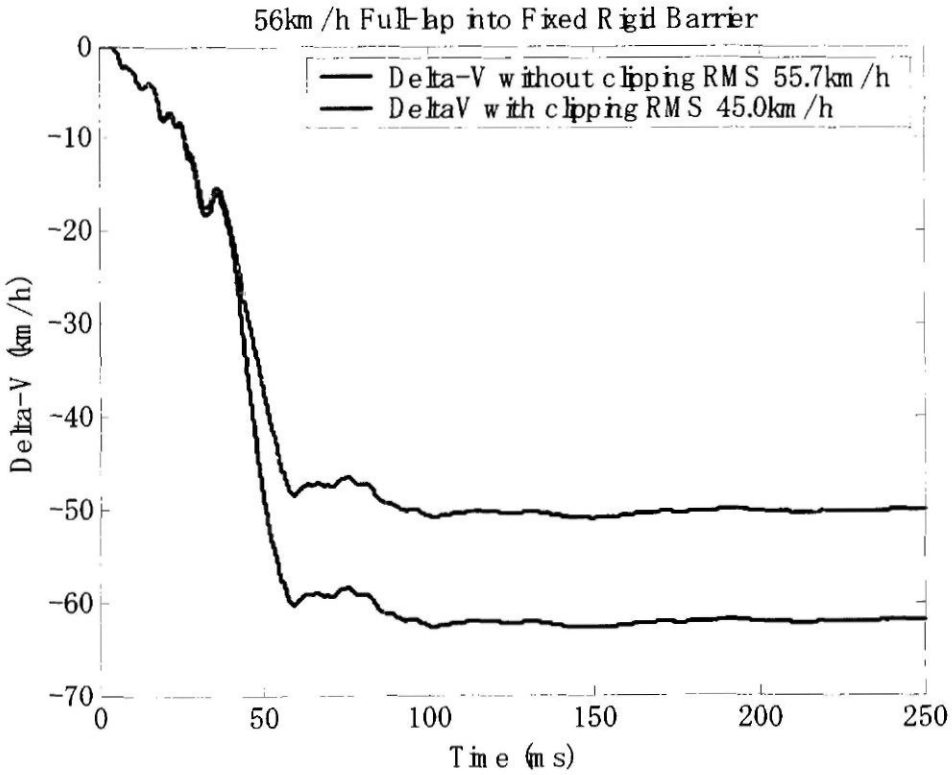
Sincerely,

Robert Strassburger
Vice-President
Vehicle Safety and Harmonization
Alliance of Automobile Manufacturers


56km/h Full-lap into Fixed Rigid Barrier
Acceleration without clipping
Acceleration with clipping
Acceleration (G)
Time (ms)
60
40
20
0
-20
-40
-60
-80
-100
-120
0
50
100
150
200
250


56km/h Full-lap into Fixed Rigid Barrier
Delta-V without clipping RMS 55.7km/h
DeltaV with clipping RMS 45.0km/h
Delta-V (km/h)
Time (ms)
0
-10
-20
-30
-40
-50
-60
-70
0
50
100
150
200
250